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Jan K. Brueckner & Stef Proost

University of California, Irvine & KU Leuven, Belgium

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Prohibitions on cross-border airline mergers preclude full integration of U.S. and foreign carriers, but a grant of antitrust immunity ("ATI") allows substantial cooperation between a U.S. airline and its foreign alliance partners. Immunity allows collaboration in the provision of international service in two principal types of markets. One market type involves travel between smaller U.S. and foreign cities, which requires an "interline" trip that crosses the networks of the two alliance partners. The other market type involves nonstop travel between the partners' (larger) hub cities, where overlapping service allows the trip to be made using either the U.S. airline or its partner. Immunity has often been granted in conjunction with an open-skies agreement between the United States and the home country of a partner airline.

The effects of alliances and ATI on airfares have been extensively investigated in the economics literature. Theory predicts that, for interline trips, cooperation in fare setting under ATI eliminates a type of double marginalization. Instead of non-cooperatively setting the components of an interline fare for travel across two networks, the two carriers under ATI jointly set the entire fare, reducing their two separate "markups" to one. The result is a lower interline fare, which raises traffic in these markets while benefiting passengers as well as airlines. By contrast, in allowing cooperation on overlapping nonstop hub-to-hub routes, ATI introduces a potential anticompetitive effect. Cooperating carriers may have an incentive to raise fares for origin-destination passengers on these routes, restricting the number of hub-to-hub tickets sold and boosting the carriers' combined profits. This effect may emerge even though interline traffic using the hub-to-hub route rises.

Brueckner[2] provides a theoretical analysis of both effects, showing that, while the net welfare impact on consumers is generally ambiguous, the beneficial impact in interline markets is likely to offset the potential negative effect in the hub-to-hub market, making the overall effect of ATI positive. This outcome is especially likely when the hub-to-hub market is small relative to the full set of interline markets, involving relatively few origin-destination passengers.

Brueckner and Whalen,[3] Brueckner,[4] and Whalen[5] provide empirical evidence on the size of the interline fare discount from cooperative pricing, which may be as large as 25 percent.

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[1] Jan K. Brueckner is Professor of Economics at University of California, Irvine, and Academic Affiliate, LECG, LLC; Stef Proost is Academic Coordinator for the Department of Economics of the Katholieke Universiteit Leuven (K.U.Leuven), Belgium.

[2] J. K. Brueckner, *The Economics of International Codesharing: An Analysis of Airline Alliances*, INT'L J. INDUS. ORG. 19, 1475-1498, (2001).

[3] J.K. Brueckner & W.T. Whalen, *The Price Effects of International Airline Alliances*, J.L. & ECON. 43, 503-545, (2000).

[4] J.K. Brueckner, *International Airfares in the Age of Alliances: The Effects of Codesharing and Antitrust Immunity*, R. ECON. & STAT. 85, 105-118, (2003).

Brueckner and Whalen[6] also show that the fare impact of alliance cooperation on hub-to-hub routes is effectively zero, contrary to expectations.

Despite this absence of a measured fare impact, concerns about potential anticompetitive effects in hub-to-hub markets persist. In response, regulators have occasionally imposed "carve-outs" in such markets when granting ATI. A carve-out prohibits collaboration in hub-to-hub fare setting, while allowing cooperation in other markets. For example, in granting immunity to United and Lufthansa (founding partners of the Star alliance), the U.S. Department of Transportation ("DOT") imposed carve-outs in the Chicago-Frankfurt and Washington (Dulles)-Frankfurt markets, which connect United and Lufthansa hubs, while allowing the carriers to set fares cooperatively elsewhere. By contrast, in its early grant of ATI to Northwest and KLM, carve-outs were not imposed in their hub-to-hub markets (Detroit-Amsterdam and Minneapolis-Amsterdam), mainly based on the small size of these markets. Similarly, carve-outs were not imposed in any of the markets connecting the hubs of Delta and Air France, founding members of the SkyTeam alliance (Atlanta-Paris, among others).

Recently, however, carve-outs have emerged as a contentious regulatory issue. In its tentative approval of Star-alliance ATI for Continental (a former SkyTeam member), the DOT required no new hub-to-hub carve-outs. However, in an advisory opinion, the U.S. Department of Justice ("DOJ") strongly recommended a number of such carve-outs as well as other limitations to the scope of ATI, and in its final order, the DOT acquiesced in many of the DOJ carve-out recommendations (see DOJ[7] and DOT[8]). These carve-outs involved routes between the New York area and several secondary Star hubs (Stockholm, Zurich, Copenhagen), and routes between Continental's hubs and Air Canada's Toronto hub along with several additional Canadian endpoints.

Despite the centrality of carve-outs in this latest ATI decision, the economics literature on alliances offers no treatment whatsoever of this topic. Since the carve-out issue is likely to arise in future ATI cases, especially the pending ATI application of American Airlines, British Airways, and Iberia ("AA," "BA," and "IB"), we have developed a theoretical treatment of the carve-out issue using a highly-stylized model based on the one analyzed by Brueckner[9] (see our working paper[10]).

The model adds a key feature to this earlier analytical framework, which captures an important new development in the structure of alliances that is germane to the carve-out issue: The emergence of the "joint venture" as a common alliance form. Under a joint venture ("JV")

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[5] W.T. Whalen, *A Panel Data Analysis of Code Sharing, Antitrust Immunity and Open Skies Treaties in International Aviation Markets*, R. INDUS. ORG. 30, 39-61, (2007).

[6] *Supra*, note 3.

[7] U.S. Department of Justice, *Public Version, Comments of the Department of Justice on the Show Cause Order*, in DOT Docket OST-2008-0234, (2009).

[8] U.S. Department of Transportation, *Final Order*, in DOT Docket OST-2008-0234, (2009).

[9] *Supra*, note 2.

[10] J.K. Brueckner & Stef Proost, *Carve-Outs Under Airline Antitrust Immunity*, unpublished paper, University of California, Irvine, (2009).

alliance, the carriers engage in comprehensive revenue sharing on international routes, so that a partner's revenue from a passenger is independent of which airline actually provides the service. This arrangement leads to what is known as a "metal neutral" alliance structure, in the sense that the identity of the "metal" (the aircraft) involved in transportation of a particular passenger is irrelevant to individual airline revenue. Although Northwest and KLM operated a JV alliance starting in the early 1990s, this form has only recently spread to the other alliances. SkyTeam operates a JV as does the Star alliance (with Continental now participating), and the pending ATI application of AA, BA, and IB also envisions a joint venture.

Our theory adopts a particular analytical representation of a joint venture, which affects the model's portrayal of hub-to-hub routes. In the absence of a JV, the alliance partners are assumed to operate separate services on the hub-to-hub route, not capturing the full benefits of integration. With a JV, however, the hub-to-hub services are consolidated, as under a true merger. This difference affects the exploitation of economies of traffic density (increasing returns to scale) on the hub-to-hub route. Economies of density are a hallmark of airline network models, and their existence implies that cost per passenger falls as the traffic volume on a route rises, a result of the use of larger, more efficient aircraft and the spreading of fixed endpoint costs over more passengers. While a non-JV alliance divides hub-to-hub traffic between two separate airline operations, a JV alliance consolidates this traffic under a single unified entity, achieving (under the model) greater efficiencies from higher traffic density. Given the stylized nature of the framework, other efficiencies from the JV alliance, including more-effective scheduling, cannot be captured. For a good discussion of the nature of such additional benefits, see the response of American Airlines to the criticism by the DOJ.[11]

With this representation of a JV alliance, the trade-off involved in carve-outs becomes clear. By preventing collaboration in the hub-to-hub market, a carve-out eliminates a key element of a JV alliance, consolidation of operations on this route. This loss reduces the efficiency of the alliance, raising cost per passenger on the hub-to-hub route. Offsetting this downside, however, are potential competitive gains. In particular, eliminating collaboration in the hub-to-hub market prevents a possible anticompetitive increase in the hub-to-hub fare under the alliance. Whether the carve-out is harmful or beneficial depends on the net effect of these two forces. If the efficiency loss is substantial relative to any competitive gains, then the carve-out can be harmful, while a small efficiency loss will yield the opposite verdict.

Another important insight of the analysis is that imposition of a carve-out on a non-JV alliance has no efficiency downside and is thus desirable in the context of the model. In other words, since non-JV alliance partners do not operate consolidated service on the hub-to-hub route, banning collaboration on this route generates no efficiency loss. However, competitive benefits emerge, so that the carve-out is in the public interest, leading to a better outcome than a non-JV alliance without a carve-out.

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[11] American Airlines, *Response of American Airlines to the comments of the Department of Justice*, in DOT Docket OST-2008-0234, (2009).

It is interesting to note that the DOT's final order in the Continental-Star ATI case is consistent with this logic. Carve-outs were imposed only on routes that are not part of the enlarged joint venture (called A++). Carve-outs on JV routes were not required, and existing carve-outs on the routes connecting Chicago and Washington to Frankfurt (which are part of the JV) were removed.

Based on these ideas, the analysis generates the following possible rankings of alliances:

Ranking I	**Ranking II**
alliance with carve out	*JV alliance*
JV alliance	*alliance with carve out*
non-JV alliance	*non-JV alliance*

A non-JV alliance is always the lowest ranked given that it reduces hub-to-hub competition without any offsetting efficiency gain. But, following the above logic, a JV alliance could either be first or second in the alliance rankings. If its efficiency gain offsets the effect of lost hub-to-hub competition, then the JV alliance is superior to an alliance with a carve-out (where competition is preserved but efficiency is sacrificed). Conversely, if its efficiency gain is more than offset by the lost competition, then the JV alliance is inferior to an alliance with a carve-out. Our analysis quantifies this trade-off, showing that the JV alliance is superior when economies of traffic density (the source of efficiency gains in the model) are strong. This type of argument, which the airlines themselves have used to argue against carve-outs, is validated by our analysis. Thus, regulators may wish to give it some credence.